Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of

Amending Part 20 of the Commission's	)	GN Docket No. 11-117
Rules to Improve Indoor E911 Location	)	PS Docket No. 07-114
Accuracy and Enhance Public Safety	)	WC Docket No. 05-196
	)	

To: The Commission

COMMENTS

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SUMMARY

TruePosition herein presents the FCC with additional data, test results and real-world findings to assist the Federal Communications Commission in adopting reasonable and prudent regulations that will promote indoor location accuracy for Enhanced 9-1-1 (E911). The data shows that minorities and low income urban dwellers are bearing the brunt of this public safety problem due to their heavy reliance on wireless as their primary means of communication. The FCC's actions in this proceeding will undoubtedly save lives, reduce property losses and aid local governments in the efficient and effective delivery of public safety services throughout the United States.

The FCC and the public safety sector have carefully and thoroughly evaluated the issues in the two years since the FCC launched its *Second Further Notice of Proposed Rulemaking* to determine whether indoor location accuracy standards should be adopted. Given the critical intersection between high usage of wireless services indoors and the availability of proven technologies to locate indoor calls, there is simply no justification for putting off any longer a regulatory fix for this glaring public safety problem. The longer the FCC waits to adopt indoor location accuracy standards the more difficult it will be to resolve this public safety problem. Indeed, as more and more E911 calls originate from indoor, urban locations, and to the extent that wireless carriers elect to use currently-available handset-based location technology to deliver E911 location information, empirical evidence has shown that E911 indoor location accuracy will continue to erode until the FCC establishes indoor accuracy standards.

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COMMENTS

TruePosition, Inc., through its attorneys, and pursuant to Section 1.41 of the Commission's rules, 47 C.F.R. § 1.41, respectfully submits these Comments in the above-referenced Petition for Rulemaking.[1] TruePosition hereby presents the FCC with additional data, test results and real-world findings to assist the Federal Communications Commission in adopting reasonable and prudent regulations that will promote indoor location accuracy for Enhanced 9-1-1 (E911). The data shows that minorities and low income urban dwellers are bearing the brunt of this public safety problem due to their heavy reliance on wireless as their primary means of communication. The FCC's actions in this proceeding will undoubtedly save lives, reduce property losses and aid local governments in the efficient and effective delivery of public safety services throughout the United States.

I. STATEMENT OF INTEREST

TruePosition creates custom mobile location solutions for mission-critical situations where lives and safety are at stake and accuracy and reliability are paramount. TruePosition has more patents, technical expertise, and operational experience in wireless location systems and

[1] The formal comment period in the FCC's "Wireless E911Location Accuracy Requirements" rulemaking proceeding, PS Docket No. 07-114, has closed; however, the FCC may accept these Comments as an Informal Request for Commission Action under 47 C.F.R. §1.41.

services than any other company in the world. Every day more than 100 million people depend on location services supported by TruePosition's technology.

II. SUMMARY OF THE INDOOR LOCATION PROBLEM

Two years ago, the FCC launched its latest phase of E911 rulemaking proceedings with this statement: "we consider indoor location accuracy to be a significant public safety concern that requires development of indoor technical solutions and testing methodologies to verify the effectiveness of such solutions."[2] This public safety problem has only grown worse since then.

Although the FCC's rules require carriers to accurately locate wireless E911 callers when emergency calls are made from outdoor locations, the requirements for calls made indoors are, at best, unclear. *See* 47 C.F.R. §20.18(h) (Phase II accuracy standards are to be tested and measured "based on outdoor measurements only"; a fair reading of this rule is that the accuracy standards also apply indoors, but carriers are not required to test E911 signal coverage indoors). Due to the absence of a clear regulatory mandate, many wireless carriers employ technology that cannot provide accurate locations for E911 calls made from many indoor locations, creating an enormous "last corridor" service gap for public safety. Also, because of the indoor "exclusion" from the FCC's testing requirements, no carriers test E911 coverage indoors, despite the high volume of emergency calls placed from indoor locations. The result is that every single day many lives are in jeopardy.

For example, according to the *Asbury Park Press*, in January 2013, a New Jersey woman speaking in broken English made a 911 call on her cell phone, attempting to report a fire.[3] Due to miscommunication and the fact that the woman did not call from a landline, firefighters were

[2] *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Notice of Proposed Rulemaking, Third Report & Order, and Second Further Notice of Proposed Rulemaking, 26 FCC Rcd. 10074 (July 12, 2011) ("*Third Report and Order*").

[3] Michele Sahn, *Lakewood Fire Kills Boy; 911 Call was Misdirected*, ASBURY PARK PRESS, Jan. 5, 2013, http://www.app.com/article/20130104/NJNEWS/301040044/Lakewood-fire-kills-boy-911-call-was-misdirected?nclick_check=1.

dispatched to the wrong home, only to later find the actual fire two blocks away. That miscommunication and lack of accurate call location seriously delayed the response. Tragically, a six-year-old boy died in the fire and his eight-year-old brother had to be treated for burns and smoke inhalation.

Avoidable tragedies such as this are occurring more and more frequently as the volume of calls made from wireless phones rapidly increases. The FCC estimates that 70 percent of 911 calls are placed from wireless phones.[4] Conservative estimates are that 300,000 or more wireless E911 calls per day are initiated from indoor locations.[5] This public safety disaster takes a higher toll on low-income and minority households, since the majority of these households rely primarily or exclusively on wireless service, with no landline back-up for emergencies.[6]

The FCC and the public safety sector have carefully and thoroughly evaluated the issues in the two years since the FCC launched its *Second Further Notice of Proposed Rulemaking* to determine whether indoor location accuracy standards should be adopted.[7] Given the critical intersection between high usage of wireless services indoors and the availability of proven technologies to locate indoor calls, there is simply no justification for putting off any longer a regulatory fix for this glaring public safety problem. The FCC, the wireless industry and the public safety sector have the need and the ability to establish clear and simple standards and testing guidelines to address the indoor location problem. The longer the FCC waits to adopt indoor location accuracy standards the more difficult it will be to resolve this technical issue; in the meantime, public safety for millions of Americans will remain at grave risk. Indeed, as more

[4] Federal Communications Commission, *911 Wireless Services*, http://www.fcc.gov/guides/wireless-911-services.
[5] Greater details concerning these statistics are continued herein in Section IV. FCC statistics hold that of the roughly 650,000 plus 911 calls made per day, 455,000 are wireless. Multiple studies have shown that anywhere from 70% to 80% of all wireless voice and data calls initiated each day are initiated indoors. Hence, it is reasonable to conclude that no less than 300,000 E911 calls per day originate from an inside location.
[6] Centers for Disease Control and Prevention, National Center for Health Statistics, *National Health Interview Survey, July-December 2012* (June 2013).
[7] *See Third Report and Order*, *supra* at 2.

and more E911 calls originate from indoor, urban locations (as is the evident trend), and to the extent that wireless carriers elect to use currently-available handset-based location technology to deliver E911 location information, empirical evidence has shown that E911 indoor location accuracy will continue to erode until the FCC establishes indoor accuracy standards.[8]

With the data, findings and proposals contained in these Comments, as well as comments and data submitted throughout the past two years in this rulemaking proceeding, the FCC can now establish a regulatory framework to improve indoor E911 coverage for millions of Americans. The goal is to give the wireless industry the guidance and the incentives necessary to bring critical E911 services to what is now the "last corridor," those interior locations that are un-served or under-served under current E911 regulations. Just as the FCC and the broadband industry have striven to bring high speed Internet access to the "last mile," with appropriate standards and guidance from the FCC it is well within the wireless and public safety community's capabilities to fix the "last corridor" coverage problem for E911. The public interest justifications for this regulatory undertaking are obvious: this proposal will help ensure that every residence, office, school and public venue in the United States will have prompt access to critical public safety services.

In its simplest terms, TruePosition's proposal is this: apply existing outdoor accuracy requirements to E911 calls originating indoors. Recent testing conducted by the FCC's Communications Security, Reliability and Interoperability Council (CSRIC), by TruePosition and by independent testing centers, has established: (1) that technology is currently available that can achieve this goal, and (2) that the technology currently used by both Verizon and Sprint, and the handset-based GPS technology being implemented by AT&T and T-Mobile for their 3G platforms

[8] *See, e.g.*, "PSAP challenges in using GPS to locate 911 calls from cellphones." Ovum Consulting (June 2010) (a copy of this study is attached hereto as Attachment Two). *See also*, "Getting to Z: Indoor Positioning with GPS," A. Cameron, *GPS World* (November 28, 2012), http://gpsworld.com/getting-to-z/.

perform poorly indoors.[9] Moreover, these studies show that once the appropriate baseline performance has been established for representative "morphologies," indoor testing is accurate, it can be conducted in representative "test beds" nationwide, and it need not be prohibitively expensive.

Seismic shifts by millions of consumers toward wireless services to the exclusion of wireline services lead to the inescapable conclusion that we should no longer depend on E911 solutions that may be ineffective for nearly half of the E911 calls placed throughout the United States every day. Lives, property and government resources will be at risk every day until the problem of indoor E911 accuracy is fixed. The incremental costs that would be incurred in fixing this problem pale by comparison to the incalculable costs of continuing to ignore this public safety imperative.

III. REGULATORY PRECEDENTS SUPPORT INDOOR STANDARDS

Over the past 15 years, the FCC has led the wireless industry through a steady progression of regulatory steps designed to ensure that wireless services will be fully integrated into our Nation's 911 public safety network. Despite some initial reluctance, the wireless industry came to embrace the FCC's initiatives; carriers and equipment manufacturers found cost-effective ways to meet the FCC's public safety goals.

Today, the wireless industry enthusiastically supports its critical role as guardian of its customers' lives, property and safety through the widespread availability of E911 services. The integration of wireless networks into the Nation's 911 system did not happen overnight; it was the result of steady FCC prodding through a series of rulemaking initiatives. The FCC should now

[9] AT&T some time ago notified the FCC in public filings of its intent to employ AGPS/handset based technology in its 3G network for E911 purposes and that it anticipated that it would be able to "meet the proposed location accuracy benchmarks … given the general availability of AGPS technology from device and infrastructure vendors." *See* AT&T letter to M. Dortch, FCC Secretary, "Re Wireless E911 Location Accuracy Requirements – Docket 07-114," (May 13, 2010).

prod the wireless industry to begin improving indoor E911 accuracy by adopting indoor accuracy standards. This action is the logical next step in the regulatory history set forth in Attachment One, attached hereto.

IV. IMPROVING INDOOR LOCATION ACCURACY IS OF PARAMOUNT CONCERN TO PUBLIC SAFETY

Many publicly available reports and studies show that indoor wireless calls have increased dramatically in the past few years, to an average of at least 60 percent and perhaps as high as 80 percent of all calls made, up from 40 percent in 2003.[10] That statistic alone - the fact that a large percentage of E911 calls placed every day in our Nation might be beyond the ability of public safety officials to accurately locate - would warrant urgent regulatory action. But, that statistic only scratches the surface of the enormous demographic changes that are taking place in the U.S. with regard to wireless usage. Recent demographic data from highly reliable sources shows that the lack of indoor accuracy for E911 has the harshest impact on minorities and low income families. When one looks at these broader wireless usage patterns, it becomes obvious that there is an absolutely critical need to fix this problem right away.

A. Wireless Usage Patterns

The United Nations Telecommunications Development Sector (TDS) reported that in 2001, approximately 128.5 million cell phone subscriptions were active in the United States.[11] Ten years later, that number jumped to 290.3 million.[12] Today, there are more cell phone

[10] *See, e.g.*, J.D. Power and Associates: U.S. 2011 Wireless Call Quality Performance Study, vol. 1.
[11] United Nations International Telecommunication Union, Telecommunications Development Sector, *Mobile Cellular Subscriptions* (2012).
[12] *Id.*

subscriptions in the United States than there are citizens.[13] Conversely, while there were 191.57 million landline numbers in 2001, only 145.87 million remained in 2011.[14]

According to the Centers for Disease Control and Prevention's National Health Interview Survey (NHIS), conducted between January and December of 2012, nearly two in every five households (38.2%) in the U.S. have only wireless telephone access.[15] This is an increase of 2.4 percentage points since the first half of 2012.[16] In the second half of 2008, this number was 20.2%, demonstrating a marked rise in wireless-only households over a period of just four years.[17] In addition, many residents living in households with landline phones rely primarily on wireless phone service. An additional 15.9% of U.S. households fall into this category, so over 54% of American households rely primarily on a wireless phone for their family's telecommunications service.[18]

B. Wireless Demographics and Their Impact on 911 Services

The wireless usage numbers are even more compelling when broken down by demographic groups. In the United States today, 45% of all children (under 18 years of age) live in households with only wireless telephones.[19] This has direct implications for emergency response services since children are the least likely to be able to describe an exact address or location during an emergency situation. An overwhelming six in ten adults between the ages of 25 and 29 (62.1%) live in homes with only wireless telephone access.[20] The percentage is even higher for adults living only with unrelated adult roommates. Over three quarters (75.9%) of

[13] CTIA- The Wireless Association, *CTIA Semi-Annual Wireless Industry Survey* (May 2013).
[14] United Nations Telecommunications Development Sector, International Telecommunication Union, *Fixed-Telephone Subscriptions* (2012).
[15] Centers for Disease Control and Prevention, National Center for Health Statistics, *National Health Interview Survey, July-December 2012* (June 2013).
[16] *Id.*
[17] *Id.*
[18] *Id.*
[19] *Id.*
[20] *Id.*

these individuals have no access to a landline phone.[21] Apartment and house renters also fall into the majority-wireless-only category. Fifty-eight percent of adults renting their homes have only wireless telephones.[22]

The poorest citizens in the United States are also the ones who have the least access to traditional landline service and are most at risk from inaccurate E911 services. The latest CDC surveys reveal that the majority of adults living in poverty, over 54%, rely exclusively on wireless for their residential phone service.[23] The number of "near poverty" wireless-only households is also very high, over 45% of those households rely exclusively on wireless for their household phone services. Given that many of these low-income households also live in high-rise apartment buildings in urban areas, the lack of indoor accuracy standards for E911 is a very real and constant threat to these citizens. Given that these households would reasonably presume that their monthly wireless fees include a functional 911 feature, it is fair to view this as both a consumer safety and a consumer fairness issue.

The data demonstrate that flaws in our national E911 system weigh more heavily on certain racial and ethnic groups, in addition to the adverse impact on low income families. Beginning in the latter half of 2012, over half of Latino households in the U.S. (50.5%) became wireless-only households.[24] Since English is a second language for a sizeable portion of the Latino community in the United States, communication errors are prevalent in emergency situations. On average, African-American households are now 39% wireless-only households, meaning that they have no back-up landline support if E911 cannot accurately locate them in response to an emergency call.

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[21] *Id.*
[22] *Id.*
[23] *Id.*
[24] *Id.*

Those in wireless-only homes are also much less likely to have health insurance than those in homes with landlines. While only 15.1% of adults under 65 who have landlines do not have health insurance, 27.9% of Americans without landline service lack health insurance coverage.[25] As such, they are less likely to have received preventative health care and thus are at a higher risk of experiencing a medical emergency requiring 911 assistance.

In sum, the very families that are most likely to need prompt emergency response to medical, crime and property damage emergencies, are perversely the ones least likely to receive those services, due to no fault of their own. These are paying wireless subscribers, people who have a right to expect that when they dial 911 from their wireless phones, first responders will be able to accurately locate them.

C. Wireless Calls and Emergency Response

These demographic data points are significant in the emergency response context. According to CTIA—The Wireless Association, nearly 400,000 wireless 911 calls are made every day.[26] In 2010, 108 million emergency calls came from wireless phones.[27] The FCC currently estimates that about 70% of 911 calls are placed from wireless phones, and the agency predicts that the percentage will continue to grow over time.[28]

In April 2012, the Pew Research Center released a survey that found that 19% of cell phone users had used their phone in the past 30 days to obtain help in an emergency situation.[29] That same study noted that urban cell phone users were 40% more likely to use their phone for an emergency call than rural cell phone owners.[30] Unfortunately, it is in dense, urban areas with tall buildings that Assisted GPS (AGPS), the technology preferred by wireless carriers to meet

[25] *Id.*
[26] CTIA- The Wireless Association, *Enhanced 911*, http://www.ctia.org/advocacy/policy_topics/topic.cfm/TID/8.
[27] OVUM, *The Importance of Locating Wireless 9-1-1 Calls Indoors* (April 2012) (citing CTIA and NENA).
[28] Federal Communications Commission, *911 Wireless Services*, http://www.fcc.gov/guides/wireless-911-services.
[29] Pew Research Center, *Internet & American Life Mobile Survey* (April 3, 2012).
[30] *Id.*

the current "outdoor only" accuracy requirements, performs most poorly, making it difficult for first responders to accurately determine the location of wireless users. Moreover, recent testing, discussed in more detail below, shows that the fallback technologies relied on by the carriers when AGPS fails – AFTL and RTT – are unreliable and inaccurate.

College and high school dormitories, school buildings and class rooms, retirement communities, apartment complexes, nursing homes, parking garages, office complexes, entertainment arenas, sports stadiums—all of these densely-populated buildings and venues are essentially ignored by the "outdoor only" accuracy requirements under current FCC regulations. Current FCC requirements could leave an entire university campus vulnerable to large position errors in the places most likely to be in need of assistance. When we view this location problem in the broader context of quantifiable statistics concerning ever increasing wireless usage inside buildings, the potential for disaster on a daily basis is truly alarming.

D. Lives and Property Lost

Evidence of the public safety problems created by the absence of indoor accuracy standards has been mounting at an alarming rate. An August 2008 *USA Today* news article highlighted the terrible consequences of a 911 system that essentially ignores a significant and growing portion of the population every day. It reported the story of a thirty-nine-year-old mother of two who called 911 on her cell phone. Georgia resident Darlene Dukes was barely able to speak because of a blood clot in her lungs.[31] Due to a miscommunication on the phone and the inability to pinpoint Darlene's exact location, the 911 operator sent an ambulance to a location 28 miles from the apartment where Darlene was dying. Paramedics finally reached the nearly lifeless woman one hour later; she died not long after. The article sums up the chilling

[31] Becky Vevea, *Cellphones Problematic for 911*, USA TODAY, Aug. 18, 2009, http://usatoday30.usatoday.com/tech/wireless/phones/2009-08-17-cellphones_N.htm.

result of the miscommunication: "That cellphone call was critical. If Dukes had called from a landline telephone, her address would have immediately popped up on the 911 operator's screen, leaving no room for confusion."[32]

Here are some examples of E911 safety problems created at least in part by the absence of indoor E911 location requirements:

- A woman in New York City suffered a stroke and dialed 911 from inside an apartment building using a cell phone. It took rescue workers eight hours to locate her. http://www.nypost.com/p/news/local/hour_stroke_vic_call_Hj1cArXID8WSdoLnsHs1mO
- A man in Texas had a heart attack on a soccer field. A call was placed from a cell phone, but no location data was available. The first responders did not arrive on time and he died. *Debbie Pedigo, the victim's wife, is a member of Find Me 911.* http://abcnews.go.com/GMA/story?id=125344&page=3

E. Regulatory Response to Date

The FCC has on numerous occasions recognized the critical importance of indoor location accuracy for E911 services. Two years ago, the FCC said that it considered "indoor location accuracy to be a significant public safety concern that requires development of indoor technical solutions and testing methodologies to verify the effectiveness of such solutions."[33] The FCC concluded that further work was needed in this area; it sought public comment on whether the Commission should require indoor location accuracy testing and, if so, using what standards.[34] The FCC inquired whether outdoor testing methodologies could be used in indoor environments, or if the standards for outdoor and indoor location accuracy testing should be different. The FCC wanted to know if traditional sampling and drive testing methods used for

[32] *Id.*
[33] *Third Report and Order*, 26 FCC Rcd 10074 at ¶86.
[34] *Id.* at ¶ 87.

outdoor testing would be appropriate for indoor testing. The FCC inquired as to the accuracy of indoor location testing methodologies and the costs and benefits associated with these methodologies. Finally, the FCC sought data regarding the percentage of emergency calls that are placed indoors today and quantification of how much an indoor location accuracy testing standard could improve the ability of emergency responders to locate someone in an emergency.[35]

In the two to three years since the FCC began aggressively looking into these indoor location accuracy issues, we now have answers to essentially all of the FCC's critical questions. During that time-period, the Commission referred the indoor testing issues to CSRIC for further development of technical recommendations. The FCC directed CSRIC to provide initial findings and recommendations to the Commission, taking into account the cost effectiveness of any recommendations, within nine months of the referral of the issue. In addition to CSRIC, TruePosition and other wireless location experts have conducted their own tests regarding indoor location accuracy. Today, available data provides a clear picture of the problem with currently deployed technologies, as well as the availability of technologies that could improve location accuracy performance, and how the FCC could adopt simple, cost-effective regulations that will help resolve glaring indoor location problems under current E911 coverage standards.

V. MULTIPLE TEST RESULTS CONFIRM ABILITY OF EXISTING TECHNOLOGIES TO PROVIDE ACCURATE INDOOR LOCATION INFORMATION FOR E911

In July of 2011, the FCC began in earnest regulatory efforts to adopt testing methodologies and develop technical solutions to fix the problem of indoor location accuracy for E911. In its *Third Report and Order*, the Commission referred the indoor testing issue to CSRIC

[35] *Id.* at ¶¶ 86-88.

with a request that it develop "technical recommendations."[36] Both prior and subsequent to the CSRIC study, additional indoor accuracy tests were conducted by TruePosition, Verizon, and independent testing entities.

These test results, summarized below, provide important answers to essentially all of the FCC's indoor location questions in the following respects: (1) CSRIC testing methodologies for indoor testing are accurate and can be replicated to support nationwide Phase II compliance standards at reasonable costs by carriers, test centers and vendors; (2) cost-effective technological solutions to the problem of indoor location accuracy are available to service providers today; (3) sample testing in representative indoor and outdoor settings will provide appropriate benchmarks in essentially every urban and suburban setting; (4) AGPS-based location technologies currently used by the major wireless carriers perform poorly in indoor locations; (5) call data confirm that the percentage of indoor emergency calls placed by wireless devices has seen a steady increase in recent years; and (6) the steady reduction in the use of GSM networks for 911 calls as the transition is made to UMTS has led to increased reliance on AGPS location technology, which has proven to be unreliable and inaccurate indoors.

A. Indoor Location Technologies

The test results discussed below represent a variety of location technologies that are either available today or under active development.

1. UTDOA

For their GSM networks, both AT&T and T-Mobile use a location technique called Uplink Time Difference of Arrival (UTDOA). UTDOA is a wireless location technology that relies on sensitive receivers, typically located at the cell towers, to determine the location of a mobile phone. UTDOA determines location, based on the time it takes a signal to travel from a

[36] *Id.* at ¶88.

mobile phone to each of the sensitive receivers called Location Measurement Units (LMUs). By using the timing information from multiple LMUs, UTDOA calculates the mobile phone's location. Because UTDOA is a network-based location technology, it does not require the mobile phone to have any special chip, hardware, or software in it. As a result, it can locate any type of mobile phone. Since UTDOA does not rely on GPS signals to locate the user, this technology works well both indoors and outdoors in most all urban and suburban environments and is commercially available today from two major vendors. This type of network-based solution becomes less effective in rural areas where there are fewer cell-sites; nevertheless, this technique can be augmented by working in hybrid mode with AGPS technology, which is widely deployed across all major carrier networks.

2. AGPS w/AFLT and AGPS w/RTT

Today in the United States, Sprint and Verizon (for their CDMA and LTE platforms) and AT&T and T-Mobile (for their UMTS platforms) rely primarily on AGPS (Assisted-GPS). GPS relies on special chipsets in wireless devices to calculate location, based on the time difference of arrival of signals to the phone from orbiting satellites. "Assisted" GPS uses additional information provided by the network to enable a mobile phone to more rapidly locate and connect with the satellites, although the time it takes to provide a location may be up to 30 seconds or longer ("Time to First Fix" or "TTFF"). In certain environments, particularly rural and suburban, AGPS can be highly accurate; but, it requires a clear view to multiple satellites in order to provide a location. Consequently, AGPS typically cannot locate wireless callers who are inside steel, glass, or concrete structures or who are inside buildings surrounded by other tall buildings or outside in "urban canyons" between tall buildings. In an effort to overcome this weakness, each of the carriers has implemented a fallback location technology in the event that AGPS fails to return a location.

Verizon and Sprint use Advance Forward Link Trilateration (AFLT). AFLT is a downlink technology, whereby the phone takes timing/distance measurements of signals from nearby cellular base stations, and reports them back to the network, which uses the measurements to compute a handset location. AT&T and T-Mobile use round-trip time (RTT), which computes a location based on the coverage area of the cell tower combined with measurement of the length of time it takes for a signal to be sent to the handset plus the length of time it takes for an acknowledgment of that signal to be received by the tower.

3. Terrestrial Beacons

Terrestrial Beacons is a location technology that utilizes signals transmitted by a network of ground based radio beacons deployed across a geographical area. The signals from multiple beacons are received by the mobile handset and processed to compute a location. The handset must be fitted with an additional antenna, receiver and processor. Currently under development by NextNav (and tested by CSRIC) is a network of beacons transmitting in the 900MHz licensed band. TruePosition also is developing a Terrestrial Beacon system utilizing digital TV signals.

4. RF Pattern Matching

RF pattern matching (RFPM), referred to at times as RF fingerprinting, uses radio frequency pattern matching to compare mobile measurements (signal strengths, signal-to-interference ratios, time delays, etc.) against a geo-referenced database of the mobile operator's radio environment.

B. Indoor Testing Methodologies

Wireless carriers, equipment vendors and others have conducted indoor testing to determine the accuracy of E911 technology for many years. More recently and at the FCC's specific direction, CSRIC Working Group III, consisting of a representative cross-section of the entire wireless and public safety sector, including all of the major wireless carriers, conducted its

own test to determine the "performance of available technologies in various representative indoor environments." *Indoor Location Test Bed Report* at 8 ("Test Bed Report"). Summarized below are the testing methods employed by these various entities at different locations throughout the United States. These studies provide objective performance results and repeatable procedures by which any wireless carrier or test center can measure the accuracy of indoor location technology for E911 purposes.

1. CSRIC San Francisco Test

In March of 2013, CSRIC Working Group III released its Test Bed Report. That report provided details of CSRIC's process for successfully establishing and completing the "test bed," along with summary testing results for the technologies employed. The Working Group developed a framework to support the operation and management of an Indoor Location Test Bed. The key elements of that framework included the following:

- Solicitation and selection of an independent third party to manage and perform testing (ultimately selecting TechnoCom)
- Establishment of a funding mechanism to share common costs among participating vendors and carriers
- Solicitation of interested and appropriate location technology vendors for participation
- Identification of representative morphologies for dense urban, urban, suburban and rural environments
- Identification of representative building types (including size, construction method and materials) within the morphologies
- Establishment of an appropriate test plan, including testing parameters

To quote at length from the Test Bed Report, CSRIC's report noted that "[t]he essence of the methodology is testing indoors in representative morphologies (i.e., distinct wireless use environments). The morphologies used in 'Stage 1' of the CSRIC test were defined as dense urban, urban, suburban and rural, which are the basic morphologies found throughout the United States. The San Francisco Bay area was chosen by WG3 because it has these four morphologies and enabled efficient testing using one test team with a reasonable amount of travel within the area."[37]

The Test Bed Report went on to state that "[i]n each morphology (or broad wireless use environment) a number of buildings of different sizes and types common in that morphology were identified. Within each building, different test points were selected to represent the range of conditions encountered within that building. The number of test points in a given building depended on its size and complexity. At each test point a statistically significant number of independent test calls was placed. The consensus of the WG3 Test Plan sub-group was that a minimum recommended sample size per technology per test point is 100 calls."[38] In all, 75 test points were selected. "Due to real world building availability and access limitations in the limited time window the eventual test point distribution somewhat favored dense urban over urban settings."[39]

CSRIC identified certain "performance attributes" that were tested. These included location accuracy, "latency" (defined as the time to obtain the first computed caller location calculated by establishing the precise time for call initiation), and "yield" (determined as the percent of calls with delivered location to the overall call attempts at each test point, regardless

[37] CSRIC Test Bed Report at 12.
[38] *Id.* at 13.
[39] *Id.*

of the time needed for delivery location[40]). The Working Group also looked at factors they called "Reported Uncertainty" (defined as "the horizontal uncertainty reported by the location systems") and, "Location Scatter," where the different location technologies were mapped against each other using "scatter diagrams."[41]

2. TechnoCom Hybrid UTDOA/AGPS Wilmington Test

Due to various contractual and practical challenges, TruePosition was unable to make its UTDOA system available in time for CSRIC's testing in the San Francisco/Bay Area. Consequently, TruePosition undertook the cost of commissioning an independent blind test by the same testing company used by CSRIC (TechnoCom), applying the same testing methodology, in an environment that duplicated the urban and suburban morphologies of the CSRIC Bay Area Test Bed.

During February and March of 2012, TechnoCom conducted a number of indoor tests for TruePosition, employing the CSRIC methodology, using a hybrid method consisting of UTDOA and AGPS. The tests were conducted in Wilmington, Delaware. The test methodology ensured representative results for a statistically significant number of test calls made from multiple building types and environments; performance characteristics conformed to the CSRIC Test Bed including accuracy, latency, yield, reported uncertainty and location scatter. A copy of the complete test results for Wilmington, DE can be found as Attachment Three, hereto.

The Wilmington test was a blind test insofar as TruePosition was not provided ground truth information. The only significant difference between CSRIC's Bay Area testing and TruePosition's Wilmington testing was that only Urban and Suburban environments were tested in Wilmington. Downtown Wilmington was deemed too small to offer a realistic Dense Urban

[40] Although "yield" was reported, undelivered locations, which in the real world would have resulted in a Phase I CID location, were not included in the accuracy computation.
[41] *Id.*

environment; rural areas near Wilmington had a cell site density higher than what was tested in the Rural environment of the indoor test bed in the Bay Area. Consequently, neither Dense Urban nor Rural environments were included in the Wilmington testing.

3. Verizon UTDOA Manhattan Test

In September of 2000, Verizon Laboratories tested the accuracy of TruePosition's UTDOA geo-location system in New York City. A complete copy of the Verizon test study is attached hereto as Attachment Four. The test area covered 1.4 square miles of dense urban mid-town Manhattan. Radio coverage in the test area was provided by fitting 30 Verizon Wireless cell sites with TruePosition receivers. About 13 of the cell sites were located within the boundaries of the test area while the remainder was located within a third of a mile from the edges of the test area. Many parts of the test area consisted of streets lined mostly with buildings, which were over 25 stories in height. The remaining parts of the test area consisted mostly of buildings of up to 10 stories in height. Overall, the test area could be characterized as being wholly an urban canyon with multi-lane streets, the Dense Urban morphology, to use the CSRIC terminology.

The CDMA Development Group (CDG) test plan was used as a basis for the testing. Twelve urban scenarios from the CDG test plan were selected and tested. Test calls were generated outdoors, on the sidewalk, and in both stationary and walking modes. Test calls were also generated indoors, within tall buildings representing the urban canyon-high rise environment. Other test calls were generated from within a car, both when the car was stationary and when it was in motion.

4. TruePosition Texas (Frisco & Austin) Test

TruePosition commissioned location testing in 2010 in the communities of Austin, Texas and Frisco, Texas. Complete results for those tests are contained in Attachment Five, hereto.

TruePosition evaluated more than 3,500 real-life E911 test calls made with PSAPs in Frisco, TX (suburban) and Austin, TX (urban) in a variety of indoor and outdoor locations. The testing utilized off-the-shelf phones registered on networks with three different air interfaces using three different location technologies:

- UTDOA on a GSM network (AT&T; also used by T-Mobile)
- AGPS/AFLT on a CDMA network (Verizon; also used by Sprint)
- AGPS/RTT on a UMTS network (T-Mobile; also used by AT&T)

The test included more than 3,500 real wireless 911 calls routed to local PSAPs, with at least ten calls from each test point and at least three iterations of calls at each test point. Both indoor and outdoor test points were selected in the locations to guarantee a reasonable representation of subscriber use. GPS surveys were performed prior to test execution to determine ground truth (latitude/longitude) of each test point.

C. Test Conclusions

The combined results of the CSRIC, TechnoCom, Verizon and TruePosition test studies demonstrate the following:

- Poor indoor performance of currently deployed AGPS based technologies
- Immediate availability of technologies capable of providing reliable and accurate indoor location data to first responders
- Existence of promising technologies under development to further enhance indoor E911 location reliability

As indicated in the consolidated summary chart set forth below, the hybrid implementation of AGPS and UTDOA provides accurate locations and 100% yield in all environments. Similarly, Terrestrial Beacons provide accurate locations in all environments, but

lower yields in urban and dense urban environments (95% and 94%, respectively). Conversely, RF Fingerprinting and the current implementations of GPS/AFLT on the CDMA networks and GPS/RTT on the UMTS networks performed poorly in terms of both accuracy and, in the case of the GPS based technologies, yield (RF Fingerprinting had excellent yields). [42]

	Yield	67th Percentile	90th Percentile	95th Percentile
Dense Urban				
Terrestrial Beacons	93.9%	57.1	102.4	154
RF Fingerprinting	99.4%	116.7	400.1	569.3
AGPS/AFLT Hybrid	85.8%	155.8	267.5	328.1
UTDOA[43]	99%	92	150	165
Urban Performance				
Terrestrial Beacons	95.4%	62.8m	141.1m	196.1m
RF Fingerprinting	99.9%	198.4m	447.8m	729.9m
AGPS/AFLT Hybrid	90.8%	226.8m	449.3m	507.1m
AGPS/RTT Hybrid	See note[44]	357.2	829.6	1438.6
UTDOA/AGPS Hybrid	100.0%	87.3m	140.7m	163.2m
Suburban Performance				
Terrestrial beacons	100.0%	28.6m	52.9m	62.2m
RF Fingerprinting	99.8%	232.1m	420.7m	571.4m

[42] As indicated in public filings with the FCC, UTDOA is currently deployed on the AT&T and T-Mobile GSM networks, but not on their UMTS networks (which rely instead on AGPS/RTT). At one time, all AT&T and T-Mobile 911 calls were routed through GSM, but this is no longer the case. 911 calls from 3G equipped phones are now directed to the UMTS network.

[43] These results are based on year 2000 cell tower density. At today's cell tower density, results would be at least 30% more accurate. The application of hybrid AGPS/UTDOA would further improve accuracy.

[44] An accuracy result was generated for all location requests. Where GPS/RTT failed to return a location, the CID location was used.

AGPS/AFLT Hybrid	91.4%	75.1m	204.8m	295.7m
AGPS/UTDOA Hybrid	100.0%	66.1m	116.2m	155.7m

Indoor Test Results

D. Overall Indoor Test Conclusions

The test results demonstrate that AGPS/UTDOA and Terrestrial Beacons solutions exceeded the FCC's current outdoor requirements for network-based positioning solutions (67% of calls within 100 meters, 90% of calls within 300 meters) in all indoor test environments; with UTDOA producing an overall average TTFF of approximately four (4) seconds and Terrestrial beacons producing an overall average TTFF of approximately 27 seconds. They also demonstrate the ready availability of practical methodologies for testing and certifying the accuracy of indoor location technologies. Finally, these test results demonstrate that maintaining the current course of increased reliance on AGP/AFLT and AGPS/RTT is a formula for disaster. The record now establishes that the problem is not related to technology; rather, the absence of E911 indoor location accuracy standards and requirements is exacerbating the indoor location public safety problem. Technology is available today to fix the problem; carriers simply need to be told what standards they need to meet and how soon they need to meet them.

VI. INDOOR ACCURACY REGULATIONS

At its crux, an indoor accuracy regulatory solution consists of three components: (1) the technology; (2) the standards; and (3) testing/certification to ensure that the standards are met. TruePosition will address each of these regulatory components below, to show why the FCC can immediately adopt indoor accuracy standards that will address a growing public safety problem.

A. The Technology

There is no need for the FCC to specify any one form of technology to fix the indoor location problem. Rather, wireless carriers should be allowed to decide for themselves which indoor accuracy technology works best for their particular networks, geographic markets and customers. The FCC's role should be to provide objective standards toward which the carriers, their equipment manufacturers and vendors can design and implement indoor accuracy solutions. The competitive market will "pick the winners." At the same time, without an indoor public safety mandate from the FCC, there would be no incentives whatsoever for wireless carriers and manufacturers to design, acquire and deploy indoor safety technologies.

B. The Standards

The FCC already requires that wireless carriers meet certain standards for locating outdoor wireless 911 calls, but not for wireless calls originating indoors.[45] The current mandate for locating E911 calls originating outdoors, and testing the accuracy of location technology, can and should be extended to all calls, both outdoors and indoors. At the outset, the regulations for locating calls originating indoors should be the current Phase II outdoor network-based accuracy targets of within 100 meters for 67% of calls and within 300 meters for 90% of calls. For now, this accomplishes one of the CSRIC working group's stated goals, that is, to have the "smallest possible search ring." Wireless carriers should be given a three-year time-frame for implementing systems that will meet the 100/300 indoor coverage standards, and there should be some regulatory requirement by which these indoor accuracy standards are tested and certified.

TruePosition knows from its research that additional advances in both network-based and handset-based technologies are on the horizon. Hence, in a further notice of proposed

[45] *See* 47 C.F.R. § 20.18(h).

rulemaking the FCC could study and, if established to be achievable with then existing technology, propose more precise indoor accuracy standards.

Just as the FCC initially licensed cellular and PCS systems from the largest to the smallest communities, it makes sense from a practical and public safety perspective for the FCC to add a geographic element to these indoor accuracy standards. The most recent U.S. Census data show that the Nation's population is moving toward urban areas at significant rates. In 2010, a total of 80.7 percent of Americans lived in urban areas, up from 79 percent in 2000. Conversely, 19.3 percent of the U.S. population lived in rural areas in 2010, down from 21 percent in 2000. At the same time, the population of urban areas grew by 12.1 percent, much faster than the country's growth rate of 9.7 percent from 2000 to 2010. Since the vast majority of indoor accuracy problems occur in Dense Urban and Urban environments, and given the sizeable shifts in population toward urban areas, carriers should be expected to focus on improving indoor E911 accuracy in the largest cities in the U.S. This will optimize network resources where the problem is at its worst, while at the same time achieving the greatest return on investment in terms of targeting the largest populations. If the FCC adopts population targets for indoor location accuracy, as it did with its Phase II regulations, one would expect that the carriers would have no difficulty meeting those goals by focusing their attention on densely populated, urban areas. *Cf.* 47 C.F.R. 20.18(h)(1)(A).

The ultimate goal to completely address the public safety needs would be to provide an accurate location for a specific apartment, office or room in a given high rise building, putting wireless E911 performance at a level similar to wireline E911 performance. This would require 67th percentile horizontal accuracy of ~10m and vertical accuracy of 2-3meters.[46] Technology

[46] The z axis solution used by NextNav in the CSRIC test is a good example of how methodical technology testing provides value. Pressure sensors can be used with any location technology solution, as NextNav has demonstrated

does not exist today to achieve these ultimate public safety goals. Nevertheless, once technologies demonstrate this level of accuracy, the FCC should revisit this issue to obtain the "smallest possible search ring" for indoor accuracy.

In addition, the FCC should require carriers to deliver a Phase II 911 location within a reasonable period of time (referred to as "latency"). FCC regulations currently do not have a Phase II latency requirement; time is a critical factor in responding to E911 calls. In the absence of a latency requirement, call location information can be delayed for minutes yet still considered to be in compliance with FCC regulations. The critical link between speed of delivery of emergency medical services and mortality rates has been studied for years and cannot be questioned. [47] Moreover, a shorter latency requirement will enable the routing of 911 calls based on reported x-y coordinates, ensuring that 911 calls are routed to appropriate PSAP. The FCC can improve response times and save lives by adopting these simple and common-sense regulatory requirements.

C. Testing & Certification

Current FCC rules regarding E911 certification and compliance provide only a partial framework for ensuring continued location accuracy outdoors and indoors. For example, under current FCC requirements, covered wireless carriers are required to "report to the Commission their plans for implementing Phase II enhanced 911 services."[48] Licensees are required to update those plans within 30 days of the adoption of any changes. These reports may be filed electronically and must be made available to customers and consumers. Unfortunately, without any regulatory requirement that carriers routinely test and verify the accuracy of their location

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with an external pressure sensor. There are a number of suppliers of solid state pressure sensors, who continue to improve the technology.

[47] "The Impact of Internet Technology On Emergency Health Care Outcomes," Susan Athey and Scott Stern, Stanford University Press (January 2002).

[48] 47 C.F.R. § 20.18(i).

technology, once these self-certifications have been submitted to the FCC, neither consumers, PSAPs nor the FCC have ready means of determining whether carriers are continuing to deliver Phase II quality location information as their networks evolve. To address this problem, this certification process should be coupled with annual or bi-annual E911 accuracy testing; these requirements should be adopted for indoor as well as outdoor accuracy.

The process for testing and certifying the accuracy of indoor location technologies need not be complicated or expensive. The CSRIC Working Group has already created a testing protocol that groups indoor locations into a small number of "morphologies" based on objective criteria such as building materials (glass, metal, wood and brick) and population density (rural, suburban, urban and dense urban). The FCC will need to require certain minimum and uniform criteria for these tests to be useful and to ensure that carriers are employing comparable testing protocols.

Indoor location technology could be assessed in a small set of "representative indoor environments" such as the CSRIC Test Bed in San Francisco. Carriers could elect to share the costs of indoor testing, with appropriate safeguards for information deemed proprietary. To achieve accurate indoor performance results without having to test inside hundreds of privately owned buildings, indoor and outdoor testing could be performed in these representative environments to establish a baseline comparison of the performance characteristics of certain technologies for each type of environment. Then, in similar markets, only sample or representative testing would need to be performed on an annual or bi-annual basis, as is largely the case today, with the assumption that the baseline relationship between building types, urban

environments and specific technologies will remain roughly constant.[49] This representative testing method would overcome carrier concerns about costs and access to buildings.

Although not currently required under the FCC's rules, periodic testing is already utilized by most wireless operators to validate outdoor E911 performance. That standard operating procedure should continue and be formalized in the FCC's rules, as it not only validates the capabilities of the carrier's chosen technology, it also validates the specific installation and configuration of the technology in a given market. Annual testing could be planned to coincide with annual building inspections by local fire and other governmental authorities, thereby minimizing if not eliminating the problem of obtaining access to buildings for representative testing. As shown from the CSRIC testing, local fire and public safety authorities are happy to assist carriers in obtaining access to buildings for purposes of performing public safety testing.

Once the testing protocols and certification requirements are in place, there should be no need for routine FCC supervision or constant regulatory revisions. As new technologies are invented, developed and deployed to meet indoor location challenges, this regulatory framework could be readily applied to those technologies. The FCC could adopt electronic reporting requirements for these test results, akin to those under 47 C.F.R. 20.18(i) for Phase II certifications; consumer and PSAP review of these reports ought to suffice to ensure that indoor and outdoor location accuracy will be maintained at FCC-authorized levels.

[49] When determining that environments are similar, both the environment and the way the technology is deployed and operated must be similar. For example, technologies that involve terrestrial beacons or receivers must have a similar deployment density in comparable "morphologies." Repeated indoor testing in multiple local environments would add little value and would not be necessary.

VII. PUBLIC INTEREST CONSIDERATIONS/STATUTORY AUTHORITY

A. The Public Interest

Since AT&T first made the digits "9-1-1" available nationally for wireline access to emergency services in 1965, the American public has come to depend on 911 service. NENA estimates that some form of 911 service was available to nearly 99 percent of the population in 96 percent of the counties in the United States, and 240 million calls are made to 911 in the United States each year.[50] The success of the Nation's 911public safety program has itself generated certain expectations throughout the United States with respect to the ubiquity and availability of 911 and E911 emergency services.

The availability of this critical service is due largely to the collective efforts of the FCC, state and local authorities and telecommunications carriers, who have used the 911 abbreviated dialing code to provide access to increasingly advanced and effective emergency service capabilities. Responsibility for establishing and designating PSAPs or appropriate default answering points, purchasing customer premises equipment (CPE), retaining and training PSAP personnel, purchasing 911network services, and implementing a cost recovery mechanism to fund all of the foregoing, among other things, are the responsibility of states and localities.

At the same time, whenever new communications technologies or changes in consumer demand have posed technical and operational challenges to the 911 system, the FCC has quickly stepped in to assist. Interconnected VOIP and wireless services are two examples of new technologies that necessitated the adoption of a uniform national approach to ensure that the quality and reliability of 911 services would not be harmed by the rapid development of these new communications technologies. The challenge of providing first responders with accurate

[50] National Emergency Number Association, *9-1-1 Statistics*, http://www.nena.org/?page=911Statistics.

location information regarding 911 calls originating indoors should be met with the same decisiveness.

B. FCC Statutory Authority to Address this Problem

The public interest standard that guided the FCC's actions throughout the regulatory history of 911 has since become a statutory mandate. Congress adopted the 911 Act to promote and enhance public safety through the use of wireless communications services. Recognizing the critical role that 911/E911 services play in achieving the Communication Act's goal of promoting safety of life and property, Congress passed the 911 Act which, among other things, made 911 the universal emergency telephone number for both wireline and wireless telephone service for the Nation. In the 911 Act, Congress made a number of findings regarding wireline and wireless 911 services, including that "improved public safety remains an important public health objective of Federal, State, and local governments and substantially facilitates interstate and foreign commerce," and that "emerging technologies can be a critical component of the end-to-end communications infrastructure connecting the public with emergency [services]."[51] The regulatory proposals set forth in these comments are entirely consistent with Congress' public safety policy objectives.

The Commission's authority to require technical changes to provide E911 features throughout indoor locations is well within Congress' directive to the Commission to require the establishment of 911 as a "universal emergency telephone number ... for reporting an emergency to appropriate authorities and requesting assistance."[52]

[51] Wireless Communications and Public Safety Act of 1999, Pub. L. No. 106-81, § 2(a), 113 Stat. 1286.
[52] *Id.* at § 3(a).

VIII. COST/BENEFIT ANALYSIS

Should the FCC adopt new indoor location accuracy standards, its actions will be entirely consistent with previous steps it has taken to strengthen the Nation's E911 location accuracy requirements for wireless carriers and their customers. To the extent that the agency deems it necessary to perform a cost/benefit analysis for regulations that will undoubtedly save lives and reduce health care costs, the cost/benefit justifications for these public safety enhancements are comparable to the analysis that previously led the FCC to expand 911 requirements to cover interconnected VOIP and CMRS wireless services.

A. Wireless Telecommunications Service Providers

Pursuant to 47 C.F.R. § 20.18(a), the Commission's 911 service requirements are only applicable to CMRS "[providers], excluding mobile satellite service operators, to the extent that they: (1) Offer real-time, two way switched voice service that is interconnected with the public switched network; and (2) Utilize an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. These requirements are applicable to entities that offer voice service to consumers by purchasing airtime or capacity at wholesale rates from CMRS licensees."

As shown by the tests conducted by CSRIC, TruePosition and others, some level of indoor location accuracy is already available throughout the U.S. using existing technologies. The adoption of indoor location standards would not require an exponential increase in capital costs to carriers. Whether through network-based technologies, or embedded in the costs of upgrading handsets to meet indoor accuracy standards, the cost to solve this critical public safety problem will be incremental. Location network sharing, joint testing and certification, and other collective cost-sharing steps could easily bring those costs down even more; just as they do so

today with respect to E911 solutions, the carriers would be free to decide, from town to town, how they would comply with the FCC's indoor accuracy requirements.[53]

Given the undeniable fact that consumers are increasingly subscribing to wireless as their primary means of personal and business service, it is reasonable for consumers to expect that all elements of that service, including E911 location services, function properly no matter where the consumer is located. Hence, it is fair to conclude that consumers are already paying carriers to fix the problem of indoor location accuracy for E911, and that carriers are compensated for E911 from monthly airtime revenues.

B. Equipment Manufacturers

Network and handset equipment manufacturers will not incur any new or additional costs as a result of these regulatory requirements since they are not directly responsible for E911 compliance. Some of the proposed technical solutions may entail slight modifications to handsets; other solutions are network solutions. In either event, these regulations may create new and innovative service opportunities for equipment manufacturers, apart from the revenues derived from E911 compliance-related sales.

C. State and Local Governments

State and local governments and Public Safety Answering Points should not be expected to incur new or additional costs as a result of these regulatory proposals. To the contrary, it is entirely likely that increased indoor accuracy requirements will improve the delivery of public safety services, eliminate time and resources spent pursuing incorrect addresses and locations, and allow far more cost-effective delivery of governmental resources.

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[53] *See*, e.g., "Cingular/Voicestream to Share Wireless Networks in New York, California and Nevada," http://www.t-mobile.com/company/PressReleases_Article.aspx?assetName=Prs_Prs_20011015&title=Cingular,%20VoiceStream%20to%20Share%20Wireless%20Networks%20in%20New%20York,%20California%20and%20Nevada.

D. Waiver Relief

As with previous FCC improvements to 911 and E911 services that required certain equipment, software and other upgrades or network modifications, to the extent that any small entities face unique circumstances with respect to these rules, such entities may always request waiver relief from the Commission.

CONCLUSION

There is a compelling public safety justification for bringing outdoor E911 location standards to indoor settings. The costs that will be incurred in adopting these standards are minimal compared to the dire consequences that will result should this problem be put off another year. For these and other reasons stated herein, TruePosition respectfully requests that the Commission proceed with haste to adopt indoor location accuracy standards for E911 services.

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